In the Claims:

1.   An autoregressive model learning device that
sequentially reads the data string of the real number
vector values and learns the probability distribution
for generation of said data string using the
5   autoregressive model comprising:

        a data updating device that updates the
sufficient statistic of the autoregressive model with
forgetting the past data using newly read data and a
parameter calculator that reads the sufficient statistic
10   updated by said data updating device and calculates the
parameter of the autoregressive model using the
sufficient statistic.

2.   An outlier and change point detection device that
calculates the outlier score and the change point score
for the data described with the sequentially input
discrete variate and/or continuous variate so as to
5   detect the outlier and the change point comprising:

        a first model learning device that learns the
generation mechanism for the read data series as the
time-series statistic model specified by the finite
number of parameters, and
10   an outlier score calculator that reads the value
of the parameters obtained through learning by said
first model learning device, calculates the outlier

score of the data based on the read parameter of the time-series model and the input data and outputs the
15   results.

3.   An outlier and change point detection device as set forth in claim 2, further comprising

as a detection device to detect the change point,

a moving average calculator that sequentially
5   reads the outlier scores calculated by said outlier score calculator and calculates their moving average,

a second model learning device that sequentially reads the moving average of the outlier scores calculated by said moving average calculator and learns
10   the generation mechanism for the moving average series in the read score as a time-series statistic model specified by the finite number of parameters, and

a change point score calculator that reads the parameter value obtained by learning by said second
15   model learning device and calculates the outlier score for each moving average based on the read parameter of the time-series model and the moving average of the input outlier scores and outputs the outlier score for each moving average as the change point score of the
20   original data.

4.   An outlier and change point detection device as set forth in claim 3, wherein

said first model learning device learns, in case
the sequentially input data are described with
5 continuous variate only, the probability distribution
for generation of said data string with sequentially
reading the data strings of the real number vector
values using the autoregressive model and further
comprises a data updating device to update the
10 sufficient statistic of the autoregressive model with
forgetting the past data using the newly read data and a
parameter calculator to read the sufficient statistic
updated by said data updating device and to calculate
the parameter of the autoregressive model using the
15 sufficient statistic.

5.   An outlier and change point detection device as
set forth in claim 3, wherein
said outlier score calculator and said change
point score calculator are considered as a single score
5 calculator, further comprising as a device to determine
the candidates of outliers and change points in the
series for the data series described in discrete and/or
continuous variates, a sort device to sort the data in
descending order based on the outlier score and the
10 change point score calculated by said score calculator
and the display device that displays the data with
higher scores according to the order sorted by said sort
device as the candidates of outliers and change points.

6.   An outlier and change point detection device as set forth in claim 3, wherein

said outlier score calculator and said change point score calculator are considered as a single score

5   calculator, further comprising, as a device to determine candidates of outliers and change points in the series for the data described in discrete and/or continuous variates sequentially input, a score judgement device that outputs the data over the predetermined threshold

10   from the outlier score and the change point score calculated by said score calculator as the candidates of outliers or change points.

7.   An autoregressive model learning method in which the data string of the real number vector values are sequentially read and the probability distribution for generation of said data string is learned using the

5   autoregressive model, comprising the steps of:

a data updating step of updating the sufficient statistic of the autoregressive model with forgetting the past data using newly read data, and

a parameter calculation step of reading the

10   sufficient statistic updated by said data updating step and calculating the parameter of the autoregressive model using the sufficient statistic.

8.   An outlier and change point detection method to detect the outlier and change point by calculating the outlier score and the change point score for the data described with the sequentially input discrete variate

5   and/or continuous variate, comprising the steps of:

a learning step of learning the mechanism to generate the read data series as a time-series statistic model specified by the finite number of parameters, and

an outlier score calculation step of reading the

10   parameter value obtained through learning by said learning step and calculating the outlier score of each data based on the read parameter of the time-series model and the input data and outputting the results.

9.   An outlier and change point detection method as set forth in claim 8, wherein

said method to detect the change point further comprises

5   a moving average calculation step of sequentially reading the outlier score calculated by said outlier score calculation step and calculating the moving average,

a second learning step of sequentially reading

10   the moving average of the outlier score calculated by said moving average calculation step and learning the generation mechanism for the moving average series in the read score as a time-series statistic model

specified by the finite number of parameters, and

15   a change point score calculation step of reading
the parameter values obtained through learning by said
second learning step, calculating the outlier score of
each moving average based on the read parameter of the
time-series model and the moving average of the input
20 outlier scores and outputting the outlier score as the
change point score of the original data.

10.   An outlier and change point detection method as
set forth in claim 9, wherein,

        in case the sequentially input data are described
with continuous variate only,

5   said learning step sequentially reads the data
string of the real number vector values and learns the
probability distribution for generation of said data
string using the autoregressive model, and updates the
sufficient statistic of the autoregressive model with
10 forgetting the past data using newly read data, reads
said updated sufficient statistic and calculates the
parameter of the autoregressive model using the
sufficient statistic.

11.   An outlier and change point detection method as
set forth in claim 9, wherein

        said outlier score calculation step and said
change point score calculation step are considered as a

5   single score calculation step and further comprising:

a step in which, as a method to determine candidates of outliers and change points in the series for the data series described with discrete and/or continuous variates, the data are sorted in descending

10   order based on said calculated outlier score and the change point score and the higher score data are displayed as the outlier and change point candidates according to the order of sorting.

12.   An outlier and change point detection method as set forth in claim 9, wherein

said outlier score calculation step and said change point score calculation step are considered as a

5   single score calculation step and further comprising a step in which, as a method to determine outlier and change point candidates in the series, the data over the predetermined threshold selected from said calculated outlier and change point scores as the candidates of

10   outliers or change points for the data described with discrete variate sequentially input and/or continuous variate.